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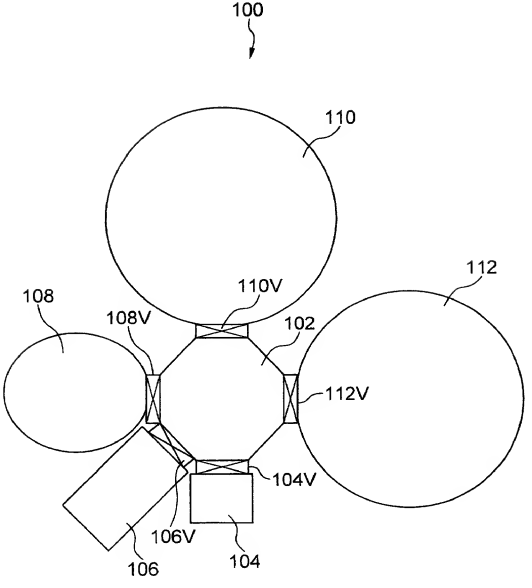

FIG. 1

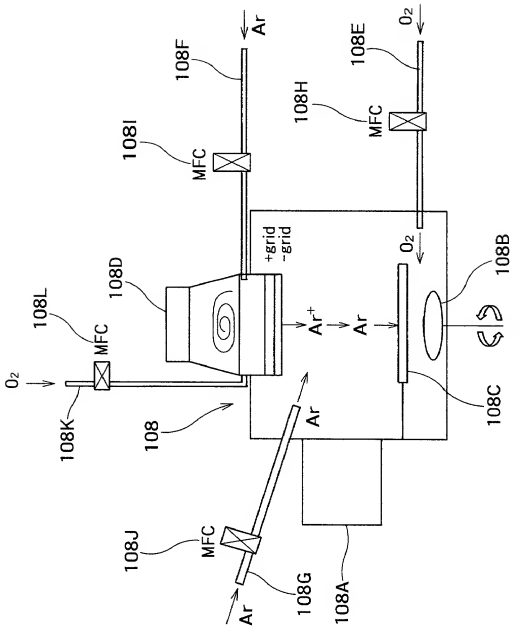
Ar
108F
108E
O_2
108H
MFC
MFC
108I
+grid
-grid
O_2
108B
108L
MFC
108D
Ar^+
Ar
O_2
108K
108
Ar
108C
108J
MFC
108G
Ar
108A

FIG. 2

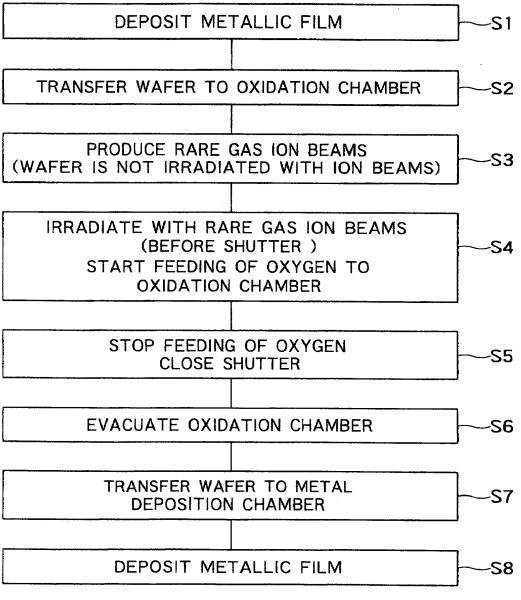
DEPOSIT METALLIC FILM
S1
TRANSFER WAFER TO OXIDATION CHAMBER
S2
PRODUCE RARE GAS ION BEAMS
(WAFER IS NOT IRRADIATED WITH ION BEAMS)
S3
IRRADIATE WITH RARE GAS ION BEAMS
(BEFORE SHUTTER)
START FEEDING OF OXYGEN TO
OXIDATION CHAMBER
S4
STOP FEEDING OF OXYGEN
CLOSE SHUTTER
S5
EVACUATE OXIDATION CHAMBER
S6
TRANSFER WAFER TO METAL
DEPOSITION CHAMBER
S7
DEPOSIT METALLIC FILM
S8

FIG. 3

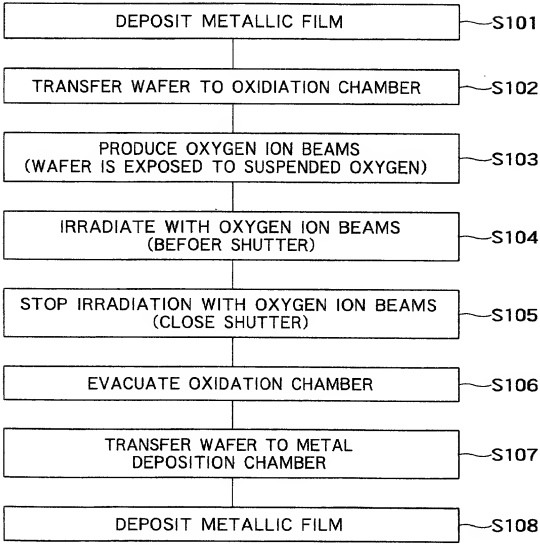
DEPOSIT METALLIC FILM
S101
TRANSFER WAFER TO OXIDIATION CHAMBER
S102
PRODUCE OXYGEN ION BEAMS
(WAFER IS EXPOSED TO SUSPENDED OXYGEN)
S103
IRRADIATE WITH OXYGEN ION BEAMS
(BEFOER SHUTTER)
S104
STOP IRRADIATION WITH OXYGEN ION BEAMS
(CLOSE SHUTTER)
S105
EVACUATE OXIDATION CHAMBER
S106
TRANSFER WAFER TO METAL
DEPOSITION CHAMBER
S107
DEPOSIT METALLIC FILM
S108

FIG. 4

T0H060 S20H060

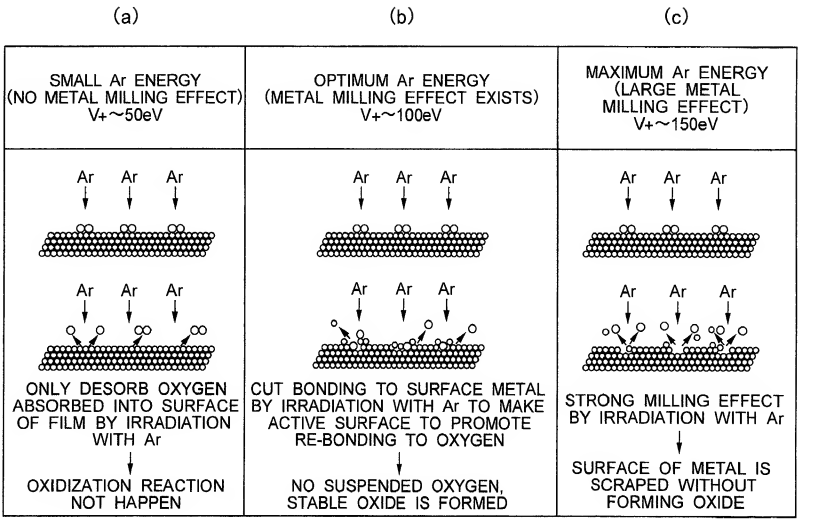

FIG. 5

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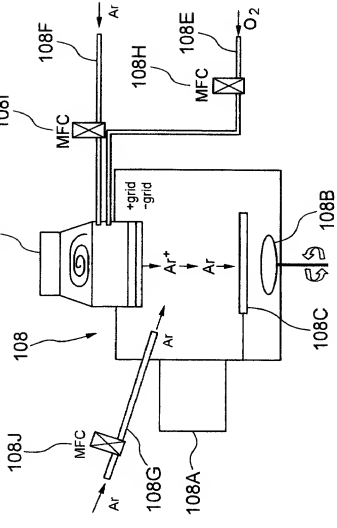

Ar
108F
108H
108E
O_2
108I
MFC
MFC
MFC
+grid
-grid
108D
Ar^+
Ar
108B
108
Ar
108C
108J
MFC
Ar
108G
108A

FIG. 6

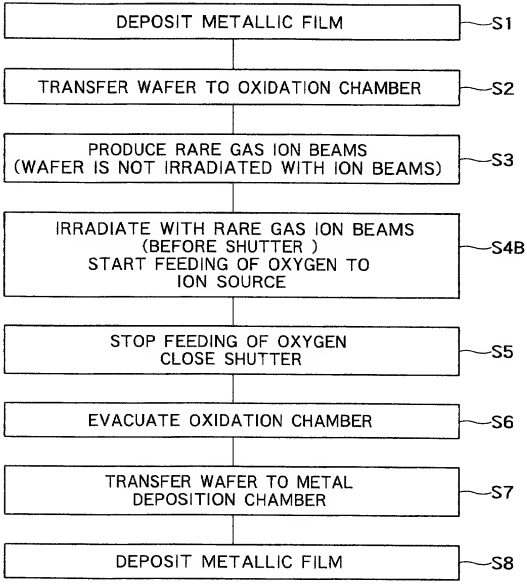

DEPOSIT METALLIC FILM
S1
TRANSFER WAFER TO OXIDATION CHAMBER
S2
PRODUCE RARE GAS ION BEAMS
(WAFER IS NOT IRRADIATED WITH ION BEAMS)
S3
IRRADIATE WITH RARE GAS ION BEAMS
(BEFORE SHUTTER)
START FEEDING OF OXYGEN TO
ION SOURCE
S4B
STOP FEEDING OF OXYGEN
CLOSE SHUTTER
S5
EVACUATE OXIDATION CHAMBER
S6
TRANSFER WAFER TO METAL
DEPOSITION CHAMBER
S7
DEPOSIT METALLIC FILM
S8

FIG. 7

108
108A
108M (108B)
108E
108L
108I
108F
108H
MFC
MFC
Ar
O_2
PLASMA
$Ar + e^-$

FIG. 8

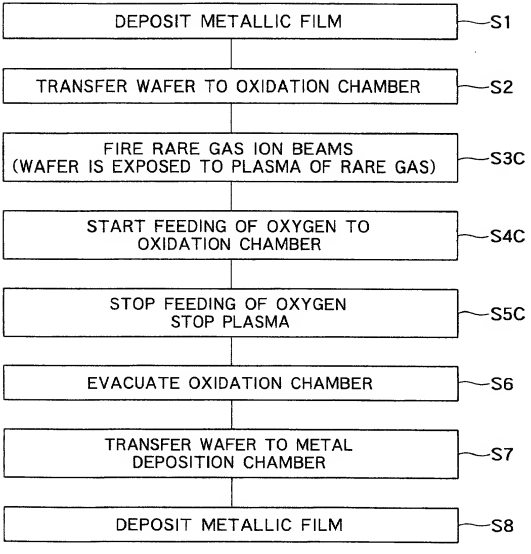

DEPOSIT METALLIC FILM
S1
TRANSFER WAFER TO OXIDATION CHAMBER
S2
FIRE RARE GAS ION BEAMS
(WAFER IS EXPOSED TO PLASMA OF RARE GAS)
S3C
START FEEDING OF OXYGEN TO
OXIDATION CHAMBER
S4C
STOP FEEDING OF OXYGEN
STOP PLASMA
S5C
EVACUATE OXIDATION CHAMBER
S6
TRANSFER WAFER TO METAL
DEPOSITION CHAMBER
S7
DEPOSIT METALLIC FILM
S8

FIG. 9

FIG. 10

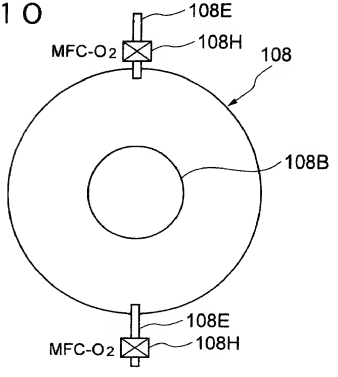
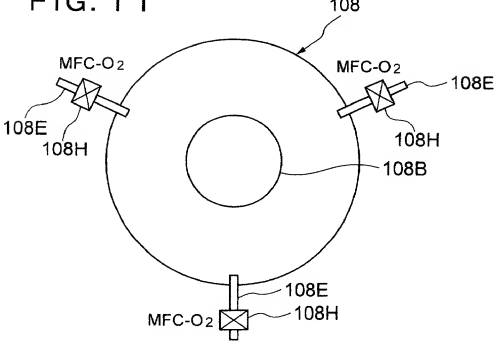

108E
MFC-O2
108H
108
108B
108E
MFC-O2
108H

FIG. 11


108
MFC-O2
MFC-O2
108E
108E
108H
108H
108B
108E
MFC-O2
108H

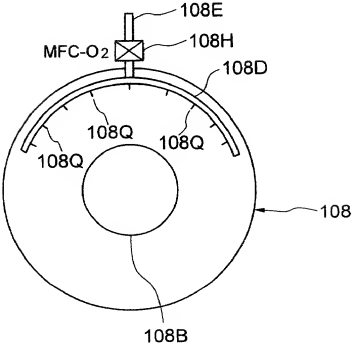


FIG. 12

EDH060 S20nm60

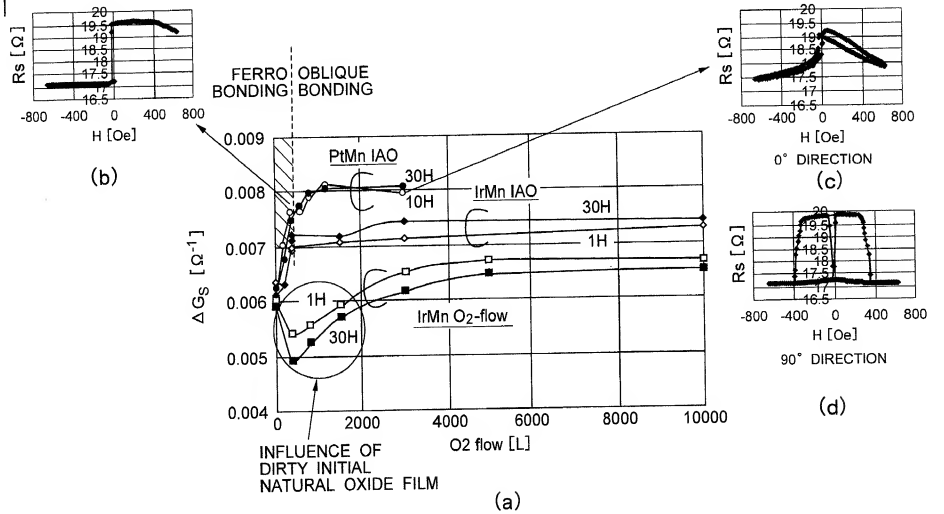


FIG. 13

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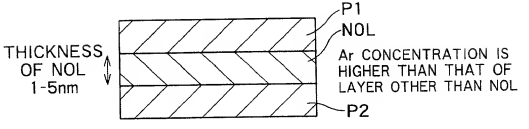
P1
NOL
THICKNESS
OF NOL
1-5nm
Ar CONCENTRATION IS
HIGHER THAN THAT OF
LAYER OTHER THAN NOL
P2

FIG. 14

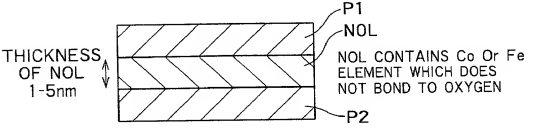
P1
NOL
THICKNESS
OF NOL
1-5nm
NOL CONTAINS Co Or Fe
ELEMENT WHICH DOES
NOT BOND TO OXYGEN
P2

FIG. 15

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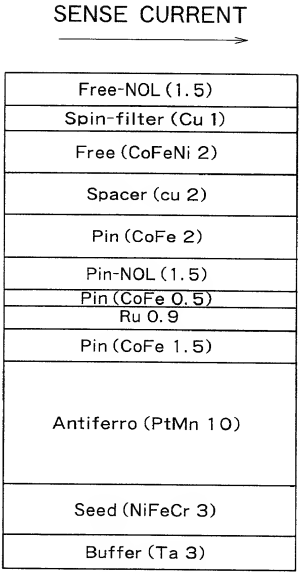

FIG. 16

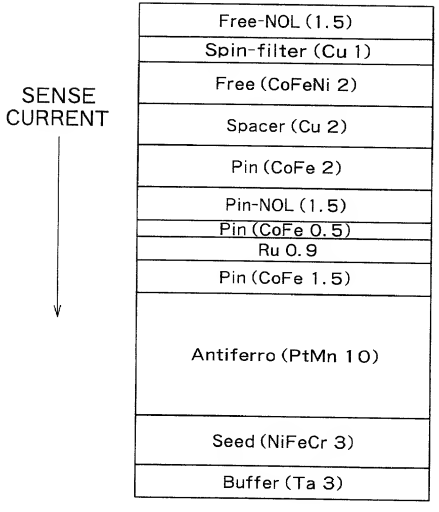
SENSE
CURRENT
Free-NOL (1.5)
Spin-filter (Cu 1)
Free (CoFeNi 2)
Spacer (Cu 2)
Pin (CoFe 2)
Pin-NOL (1.5)
Pin (CoFe 0.5)
Ru 0.9
Pin (CoFe 1.5)
Antiferro (PtMn 10)
Seed (NiFeCr 3)
Buffer (Ta 3)

FIG. 17

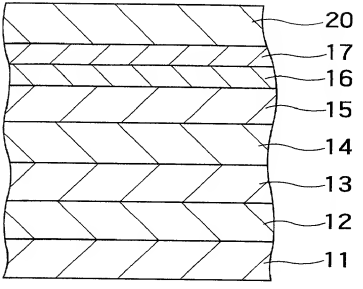

FIG. 18

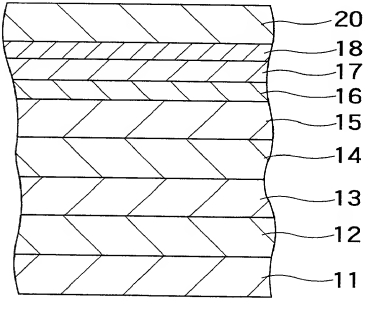

FIG. 19

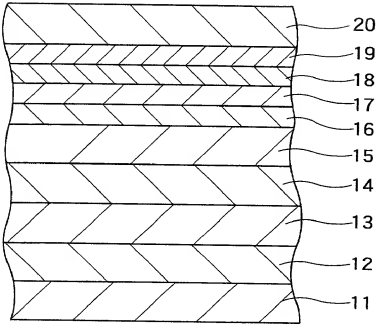

FIG. 20

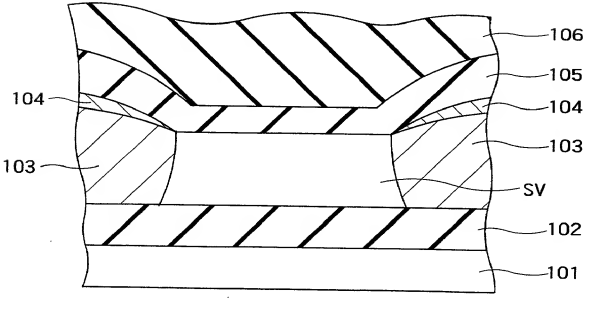

FIG. 21

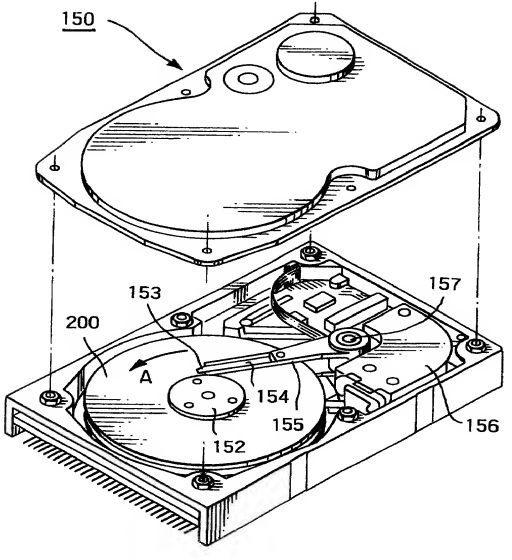

FIG. 22

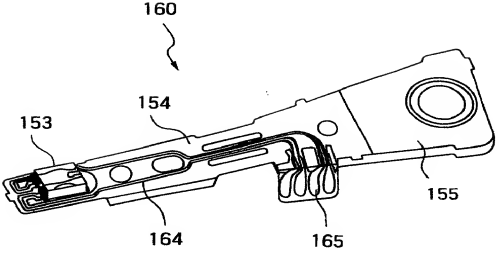

FIG. 23

20/20

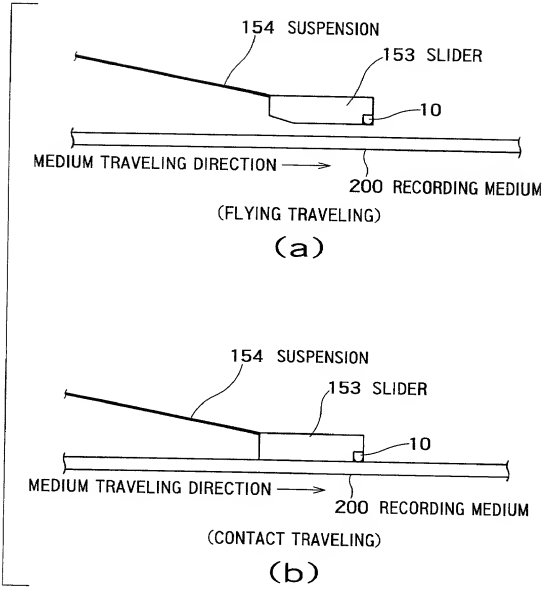
154 SUSPENSION
153 SLIDER
10
MEDIUM TRAVELING DIRECTION
200 RECORDING MEDIUM
(FLYING TRAVELING)
(a)
154 SUSPENSION
153 SLIDER
10
MEDIUM TRAVELING DIRECTION
200 RECORDING MEDIUM
(CONTACT TRAVELING)
(b)

FIG. 24